

Exposure Now, Sickness Later

Early Exposure to PCBs and Dioxins May Increase Some Childhood Diseases

It is nearly impossible to totally avoid contact with polychlorinated biphenyls (PCBs) and dioxins, ubiquitous pollutants that are produced by the electrical, plastics, pesticide, paper, and other industries. These fat-soluble toxicants accumulate in the food chain, especially in meat, fish, and dairy products. Mothers pass PCBs and dioxins to their children through the umbilical cord and breast milk.

A team now headed by pediatrician Nynke Weisglas-Kuperus of Erasmus University and Sophia Children's Hospital in Rotterdam, The Netherlands, explores the longer-term immunological consequences of PCB and dioxin exposure in older children [*EHP* 108:1203–1207]. Using data gathered under the leadership of Pieter J. J. Sauer, now chairman of pediatrics at the University of Groningen, they report for the first time that perinatal exposure to PCBs and dioxins affects the occurrence of infectious diseases and allergic disorders in preschool-age children.

The current study is part of the Dutch PCB/Dioxin Study, a longitudinal neurodevelopmental study aimed at investigating the adverse effects of background exposure to PCBs and dioxins in the growth and development of healthy full-term infants. Pregnant women were recruited by midwives in Rotterdam and the surrounding area between 1990 and 1992. The women did not know whether they were exposed to high or low amounts of PCBs and dioxins.

For 207 healthy newborn infants, perinatal exposure to the pollutants was estimated by measuring PCBs in their mothers' blood and umbilical cord blood, and by measuring PCBs and dioxins in their mothers' breast milk. About half of the infants were breast-fed; the rest drank formula from a single lot with no detectable concentrations of PCBs or dioxins.

Blood samples were taken from the children at 42 months of age. By 42 months, breast-fed children showed 3–4 times the concentration of toxicants in their blood than formula-fed children. Also at this point, each mother completed a questionnaire about her child's health status, including episodes of infectious and allergic diseases throughout the preschool years. Concentrations of circulating antibodies for mumps, measles, and rubella were also measured in the children's blood samples. All but one child had received vaccinations for these childhood illnesses at 14 months.

Among all the children, infectious diseases had occurred more often than allergic ones. For instance, 103 children (59%) suffered middle-ear infections, and 130 (74%) contracted chickenpox. In contrast, only 14 (8%) reported allergic reactions, and 17 (10%) reported attacks of shortness of breath. Perinatal exposure to PCBs and dioxins correlated with slightly lowered concentrations of antibodies for mumps and rubella. In a subgroup of 85 children, other immunologic properties were assessed, including numbers of B cells, T cells, monocytes, granulocytes, and lymphocytes. Perinatal exposure to PCBs and dioxins increased the numbers of memory, cytotoxic, and activated T cells. Together, these immune tests suggest that perinatal exposure may increase susceptibility to infectious diseases at preschool age.

The researchers found that the higher the child's body concentration of PCBs and dioxins at age 42 months, the higher the likelihood



Ear-y coincidence? Children with greater concentrations of PCBs and dioxins at age 42 months were found to be much more likely to have a history of recurrent ear infections.

of having developed recurrent ear infections or chickenpox. However, the prevalence of allergic diseases fell as the exposure to PCBs and dioxins rose. Although other researchers have observed similar connections, such as the presence of tuberculosis correlating with an absence of asthma among school children, the effect is not yet well understood.

The researchers do not discourage breast-feeding; instead, they suggest finding ways to reduce consumption of the toxicants in foods so that less is transferred perinatally to children. The researchers also conclude that future studies should monitor children later in childhood and adulthood to assess the lifetime impact of PCBs and dioxins on the immune system. —Carol Potera

Home Sick

Does Living Near a Pesticide Factory Threaten the Immune System?

As pesticides come under increasing scrutiny for their potential health effects on humans, researchers are investigating the many routes of possible exposure. In the first extensive look at risks posed by some organochlorine pesticides at sites once used for their manufacture and disposal, a team of U.S. researchers has found only a minimal impact on the immune systems of people living nearby [*EHP* 108:1113–1124]. However, certain limitations of the study suggest that additional research may be useful.

For decades, pesticides were manufactured and dumped at six small sites within two miles of each other in south-central North Carolina, near the town of Aberdeen. These sites shut down in the late 1980s and had been cleaned up to a modest extent at the time of the study. To test whether these old operations affected the immune systems of nearby residents, the team, led by Marilyn Vine of the University of North Carolina at Chapel Hill and including colleagues from the university, the North Carolina State Center for Health Statistics, and the Centers for Disease Control and

Prevention evaluated 302 people, half of whom lived in the Aberdeen area near the dump sites, and half of whom lived in near-by communities.

Researchers tested the blood of each participant for 20 organochlorine pesticides. They also evaluated four indicators of immune system function and gathered personal information such as sex, age, race, and marital status, as well as information about exposure history, medical history, and lifestyle.

One pesticide, heptachlor epoxide, was detected in the blood of one participant at a concentration of 2 parts per billion. The only other tested pesticide to appear was DDE (a metabolite of DDT), which showed up in all but one of the participants at concentrations ranging between 1 and 32 parts per billion. Those with the highest concentrations tended to be 40–59 years old and to live within a mile of the defunct Farm Chemicals plant, the most contaminated of the sites. Some of the highest readings came from residents who had lived near the site before 1985, when active manufacturing operations were still ongoing and the highest DDT soil concentrations occurred. Those who lived in the same area after the mid-1980s, when the plant shut down and some remediation work was done, had lower concentrations.

The researchers conclude that the most significant exposures for participants likely came from exhaust fans that had blown pesticide dust out of the factories and into the surrounding area. Although groundwater cannot be ruled out as a source of DDE exposure, the preponderance of evidence suggests that groundwater was not the primary source for the high DDE concentrations in the residents' blood.

The researchers found limited evidence of DNA damage (such as elevated numbers of lymphocyte micronuclei) and immune system trouble (such as reduced lymphocyte function or a lower percentage of natural killer cells) in the subjects aged 40–59 who lived near the Farm Chemicals site. But the readings of most participants were well within normal ranges, and well below nationwide averages from the late 1970s, after the 1972 U.S. ban of DDT.

One major limitation of the study was the low rate of participation—only residents who were living in the study area and willing to participate were included. This eliminated people who had lived near the site years before but had since moved or died, and made it difficult to match participants with controls for basic traits such as sex, age, length of residence, and lifestyle habits. In addition, two vulnerable age groups, children and seniors, weren't included in the study. The researchers conclude that the magnitude of the effects they found are of uncertain clinical significance. —Bob Weinhold

Smoking Gun

Other Risk Factors Ruled Out for Women Exposed to ETS

Recent findings by a group of Italian investigators led by Francesco Forastiere of the Agency of Public Health in Rome, Italy, add new fuel to the firestorm of debate about the effects of exposure to environmental tobacco smoke, or ETS [*EHP* 108:1171–1177]. The focus of their study was to compare the characteristics of two subsets of nonsmoking adult women in four areas of Italy: those who were exposed to ETS through their husbands' smoking and those who were not exposed, being married to nonsmokers. Specifically, they sought to evaluate whether the risk factors associated with cardiovascular and pulmonary diseases and lung cancer occurred differently among the exposed and unexposed women, possibly indicating that adverse health effects attributed to ETS exposure might instead be caused by other factors shared by the women married to smokers.

Although they did identify some sociodemographic and dietary differences between the two groups of women, the scientists say their results do not support earlier claims that ETS-exposed people more frequently exhibit other risk factors for cardiovascular and pulmonary disease than nonexposed people.

The researchers collected voluminous data from each of the 1,938 women, who had participated earlier in a cross-sectional epidemiologic study of the role of air pollution on respiratory conditions. The women were asked to fill out two self-administered questionnaires. The first questionnaire gathered demographic information and answers to questions about many relevant variables, including ETS exposure, exposure to toxic substances at work, family medical history, personal medical history, physical exercise habits, and other preventive behaviors. The second questionnaire was used to assess the women's dietary habits.

Each woman was also given a thorough medical examination, and contributed urine and blood samples. The urine samples were used to confirm the subjects' reported nonsmoking status and to help quantify ETS exposure. Blood samples underwent laboratory analysis to determine concentrations of cholesterol, vitamins, and antioxidants in order to assess diet and overall health.

Sophisticated statistical analysis led to some interesting comparative results between the two groups. The women married to smokers were found to be less educated than the women married to nonsmokers. They also tended to live in more crowded dwellings, were significantly less likely to eat cooked or fresh vegetables more than once a day, and had significantly higher urine cotinine concentrations due to ETS exposure. Aside from these factors—which the researchers concluded were unsurprising given that smoking in Italy occurs more frequently among men of lower socioeconomic status (as well as among women of higher status)—both groups were remarkably similar.

The investigators state that there were no significant differences between the two groups that would imply increased risk factors among the ETS-exposed women other than the exposure to ETS itself.

After controlling for various factors in their data analysis, the researchers conclude that women married to smokers do not differ significantly from women married to nonsmokers.

That assertion bolsters previous research suggesting that the deleterious health effects attributed to ETS exposure do not in fact arise from other causes.

—Ernie Hood



Amok Greenwell